

4.6 Using Vertex Form to Create Quadratic Models

p 242
Examples and Handout

$$y = a(x-h)^2 + k$$

$$y = a(x-2)^2 + 5$$

$$9 = a(4-2)^2 + 5$$

$$9 = a(2)^2 + 5$$

$$9 = a(4) + 5$$

$$9 - 5 = 4a + 5$$

$$4 = 4a$$

$$\frac{4}{4} = a$$

$$a = 1$$

$$y = (x-2)^2 + 5$$

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EXAMPLE 2 Representing a quadratic function from data

A hose sprays a stream of water across a lawn. The table shows the approximate height of the stream above the lawn at various distances from the person holding the nozzle. Write an algebraic model in vertex form that relates the height of the water to the distance from the person. Check your answer using a graphing calculator.

Distance from Nozzle (m)	0	1	2	3	4	5	6	7	8
Height above Lawn (m)	0.5	1.4	2.1	2.6	2.9	3.0	2.9	2.5	1.9

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h, k (2, 3)
x, y (0, 0.5)

$$y = a(x-h)^2 + k$$

$$y = a(x-2)^2 + 3$$

$$0.5 = a(0-2)^2 + 3$$

$$0.5 = a(4) + 3$$

$$0.5 = 4a + 3$$

$$0.5 - 3 = 4a + 3$$

$$-2.5 = 4a + 3$$

$$-2.5 - 3 = 4a$$

$$-5.5 = 4a$$

$$\frac{-5.5}{4} = a$$

$$a = -1.375$$

$$y = -1.375(x-2)^2 + 3$$

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EXAMPLE 3 Selecting a strategy to determine the equation of a curve of good fit: Graphing software

A plastic glider is launched from a hilltop. The height of the glider above the ground at a given time is recorded in the table. When will it reach a height of 45 m?

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Time (s)	0	1	2	3	4	5	6	7	8	9	10
Height (m)	16.0	12.5	9.5	7.0	5.0	3.5	2.5	2.0	2.0	2.5	3.5

Time (s)	11	12	13	14	15	16	17	18	19	20
Height (m)	5.0	7.0	9.5	12.5	16.0	20.0	24.5	29.5	35.0	41.0

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In Summary

Key Ideas

- If a scatter plot has a parabolic shape and its curve of good fit passes through or near the vertex, then the vertex form of the quadratic function can determine an algebraic model of the relationship.
- Once the algebraic model has been determined, it can be used to solve problems involving the relationship.

Oct 29-10:59 AM